

Directional Derivative Part I

1. Find the directional derivative of f at the given point in the direction indicated by the angle θ .

$$f(x, y) = y \cdot \cos(x \cdot y), (0, 1), \theta = \frac{\pi}{6}$$

2. Find the directional derivative of f at the given point in the direction indicated by the angle θ .

$$f(x, y) = \sqrt{2x + 3y}, (3, 1), \theta = -\frac{\pi}{6}$$

3. Consider the following equation.

$$f(x, y) = \sin(5x + 3y), P(-9, 15), \mathbf{u} = \frac{1}{2}(\sqrt{3}\mathbf{i} - \mathbf{j})$$

(a) Find the gradient of f .

$$\nabla f(x, y) =$$

(b) Evaluate the gradient at the point P .

$$\nabla f(-9, 15) =$$

(c) Find the rate of change of f at P in the direction of the vector \mathbf{u} .

$$D_{\mathbf{u}}f(-9, 15)$$

4. Consider the following equation.

$$f(x, y) = \frac{y^3}{x}, P(1, 2), \mathbf{u} = \frac{1}{3}(2\mathbf{i} + \sqrt{5}\mathbf{j})$$

(a) Find the gradient of f .

$$\nabla f(x, y) =$$

(b) Evaluate the gradient at the point P .

$$\nabla f(1,2) =$$

(c) Find the rate of change of f at P in the direction of the vector \mathbf{u} .

$$D_{\mathbf{u}}f(1,2)$$

5. Find the directional derivative of the function at the given point in the direction of the vector v .

$$f(x, y, z) = xe^y + ye^z + ze^x, (0, 0, 0), \mathbf{v} = \langle 6, 1, -1 \rangle$$